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Publications of the Space Physiology and Countermeasures Program, Neuroscience Discipline: 1980–1990

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PREFACE

This bibliography contains publications resulting from research supported by the Neuroscience Discipline of the NASA Space Physiology and Countermeasures Program during the years 1980-1990. It is one of a series of four bibliographies being published in 1992 of the disciplines of the Space Physiology and Countermeasures Program. Others in this series include publications from the Regulatory Physiology, Cardiopulmonary, and Musculoskeletal Disciplines. Portions of this compilation have been published previously as part of a series of bibliographies of space biomedical research. Previous editions in this series cover the years 1980-1982 (NASA CR-3587), 1982-1983 (NASA CR-3739), 1983-1984 (NASA CR-3860), 1984-1986 (NASA CR-4184), and 1987-1988 (NASA CR-187840).

This bibliography is divided into six sections: Space Motion Sickness; Vestibular Performance, Posture, and Motor Coordination; Vestibular Physiology; Central and Peripheral Nervous System Physiology; General Performance and Methodologies; and General Physiology. Space Motion Sickness includes studies of the occurrence, etiology, treatments, and effects of space adaptation syndrome. Vestibular Performance, Posture, and Motor Coordination includes non-invasive studies of vestibular function and performance done in humans and animals. Vestibular Physiology includes invasive or experimental studies of vestibular function focussing on anatomy, physiology, and mechanisms of function on a structural level. Central and Peripheral Nervous System Physiology contains studies of nervous system anatomy and physiology not including vestibular function. General Performance and Methodologies contains a variety of publications regarding human performance and experiment, equipment, and technique performance. The last section, General Physiology, is included to provide the reader with additional, background material in space physiology research. NASA-funded investigators whose work resulted in these publications are identified by an asterisk. A principal investigator index of researchers conducting Neuroscience investigations, as well as a list of neuroscience investigators and their affiliations, is also included in the bibliography.

As part of our continuing interaction with the scientific and professional community, we are pleased to present this bibliography in an effort to stimulate an exchange of information and ideas among scientists working in this discipline. I would like to thank April Commodore Roy and Audrey Robin Brown for their technical assistance in the production of this bibliography.

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INTRODUCTION

The Neuroscience Discipline is part of the Space Physiology and Countermeasures Program of the NASA Life Sciences Division. Space life sciences research was initiated in 1960 with the goal of enabling human survival in space. Now, in the late 20th century, the program is evolving to ensure human health and productivity on space missions: on the space shuttle in the 1990s, then on Space Station Freedom, and ultimately on the Moon and missions to Mars.

The goals of the Neuroscience Discipline are to understand the acute and long-term central and peripheral nervous system adaptation to space and to develop adequate physiological and performance countermeasures. The Neuroscience Discipline is comprised of several subdisciplines: Central Processing, Motion, Cognitive/Spatial Orientation, and Sensory Receptor. This multidisciplinary effort incorporates basic, applied, and operational research, both ground-based and in-flight. Research, conducted at NASA centers and in universities, includes human and animal (rats and non-human primates) subjects.

Specific objectives of the Central Processing subdiscipline are to understand the central neural mechanisms that contribute to spatial orientation; understand how signals from multiple senses related to gaze, body orientation, and motion are integrated at various sites in the central nervous system; understand the central processing that leads to space motion sickness; understand the neural basis for the adaptive responses to altered sensory environments; develop models of central processing that can be used as heuristic and productive tools for future experiments; implement pharmacological studies in order to provide a rational basis for developing drug therapies for space motion sickness; and develop, test, and validate countermeasures for neurosensory aberrations caused by exposure to microgravity. Research focuses on determining if there are changes in the processing of signals from the semicircular canals or otolith organs that occur with adaptation and if these changes take place within the vestibular nuclei, cerebellar structures, or other related brainstem and cortical structures.

Specific objectives of the Motion subdiscipline are to determine the characteristics of motor control of gaze, posture, and locomotion in altered gravity; determine how sensory inputs and coordination of muscular actions are organized before, during, and after spaceflight; determine changes in oculomotor, somatomotor, and autonomic systems in microgravity; and understand the neural circuits and physiological signals controlling motion in three-dimensional space under normal conditions and in the context of adaptation to altered gravity. Research focuses on the characteristics of gaze stabilization and eye-head coordination with varying visual, vestibular, and somatosensory inputs, and how sensory inputs and coordination of muscular activities are organized for maintenance of posture and generation of locomotion before, during, and after flight.

Specific objectives of the Cognitive/Spatial Orientation subdiscipline are to understand how adaptive changes in the vestibular, proprioceptive, somatosensory, and visual systems lead to changes in spatial orientation; determine the perceptual processes, neurophysiological mechanisms, and cortical structures underlying the perception of space and self and surround motion; and determine the changes that occur in central nervous system activity during the process of adaptation to altered gravitational conditions. Research focuses on the psychophysical correlates and neural basis for perception of motion, and what psychophysical correlates can best be used to describe spatial orientation.

The specific objective of the Sensory Receptor subdiscipline is to understand the effect of different gravitational environments on the structure and function of sensory receptors.

Research focuses on determining the structure-function relationships of the otolith organs and semicircular canals, including development, plasticity, and degeneration, and the relevant sensors for posture, body movement, and spatial orientation, including the transduction process.

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SPACE MOTION SICKNESS

Baltzley, D.R.; Gower, D.W.; Kennedy*, R.S.; Lilienthal, M.G.
 Delayed effects of simulator sickness: Incidence and implications (Abstract).
Aviation, Space, and Environmental Medicine 59(5): 465, 1988. (GWU 9908)

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 The time course of postflight simulator sickness symptoms.
Aviation, Space, and Environmental Medicine 60(11): 1043-1048, 1989. (GWU 11205)

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 Isoperformance: Application of a system engineering model for motion sickness and other environmental stressors (Abstract).
Aviation, Space, and Environmental Medicine 60(5): 479, 1989. (GWU 14375)

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 Space Adaptation Syndrome: Reducing Symptomatology Through Perceptual Training. Final Report.
 Orlando, FL: Essex Corporation, 95 p., 1985. (GWU 7820)

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 Diagnostic classification of changes in the human electrogastrogram during motion sickness (Abstract).
Aviation, Space, and Environmental Medicine 61(5): 490, 1990. (GWU 13184)

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 Dynamics of subjective discomfort in motion sickness as measured with a magnitude estimation method.
Aviation, Space, and Environmental Medicine 53(8): 773-777, 1982. (GWU 3137)

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 Mechanics of vomiting: A minireview.
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Aviation, Space, and Environmental Medicine 57(11): 1066-1070, 1986. (GWU 7276)

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 The central nervous connections involved in the vomiting reflex.
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 Effect of ablation of area postrema on frequency and latency of motion sickness-induced emesis in the squirrel monkey.
Physiology & Behavior 24(5): 849-853, 1980. (GWU 717)

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 Effects of lesions in lower brain stem and cerebellar vermis on motion sickness-induced emesis in the squirrel monkey (Abstract).
Society for Neuroscience Abstracts 6: 70, 1980. (GWU 2558)

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Empirically determined reliability of scores for several motion sickness susceptibility tests (Abstract).

In: *Abstracts of Papers, Physiologic Adaptation of Man in Space, 7th International Man in Space Symposium*, Houston, TX, February 10-13, 1986, 1 p. (GWU 7767)

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Aviation, Space, and Environmental Medicine 58(9, Suppl.): A50-A54, 1987. (GWU 8680)

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Motion sickness susceptibility and aerobic fitness: A longitudinal study.

Aviation, Space, and Environmental Medicine 61(3): 201-204, 1990. (GWU 9571)

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In: *Results of the Life Sciences DSOs Conducted Aboard the Space Shuttle 1981-1986* (Bungo, M.W., Bagian, T.M., Bowman, M.A., Levitan, B.M., Eds.). Houston, TX: NASA, Johnson Space Center, p. 19-23, 1987. (GWU 11225)

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Inflight salivary pharmacokinetics of therapeutic agents (Abstract).

In: *Space Life Sciences Symposium: Three Decades of Life Science Research in Space*, Washington, DC, June 21-26, 1987, p. 65-67. (GWU 9943)

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Aviation, Space, and Environmental Medicine 61(9): 807-809, 1990. (GWU 11715)

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Aviation, Space, and Environmental Medicine 58(8): 773-776, 1987. (GWU 8134)

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Aviation, Space, and Environmental Medicine 58(5): 508, 1987. (GWU 8805)

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Aviation, Space, and Environmental Medicine 60(5): 493, 1989. (GWU 14397)

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